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US006042901A

[54] METHOD FOR DEPOSITING FLUORINE  
DOPED SILICON DIOXIDE FILMS

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High Density Plasma Deposition and Deep Submicron Gap Fill With Low Dielectric Constant SiO<sub>2</sub> Films, L.Q. Qian et al., (Feb. 21-22, 1995), DUMIC Conference, pp. 50-56.

Dual Frequency Plasma CVD Fluorosilicate Glass Water Absorption and Stability, M.J. Shapiro et al., (Feb. 21-22, 1995), DUMIC Conference, pp. 118-123.

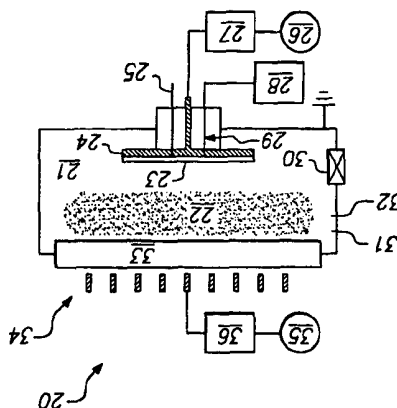
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## ABSTRACT

A process of preparing a moisture-resistant fluorine containing silicon oxide film included steps of supplying reactant gases containing silicon, oxygen and fluorine into a process chamber and generating plasma in the process chamber, supporting a substrate on a substrate support in the process chamber and growing a fluorine-containing silicon oxide film on the substrate by contacting the substrate with the plasma. The silicon and fluorine reactants can be supplied by separate gases such as  $\text{SiH}_4$  and  $\text{SiF}_4$  or as a single  $\text{SiF}_4$  gas and the oxygen reactant can be supplied by a pure oxygen gas. The  $\text{SiH}_4$  and  $\text{SiF}_4$  can be supplied in a gas flow ratio of  $\text{SiH}_4/(\text{SiH}_4+\text{SiF}_4)$  of no greater than 0.5. The process can provide a film with a fluorine content of 2–12 atomic percent and argon can be included in the plasma to assist in gap filling. The plasma can be a high density plasma produced in an ECR, TCPM, or ICP reactor and the substrate can be a silicon wafer including one or more metal layers over which the fluorine-containing silicon oxide film is deposited. The substrate support can include a gas passage which supplies a temperature control gas into a space between opposed surfaces of the substrate and the substrate support for maintaining the substrate at a desired temperature.

## 16 Claims, 2 Drawing Sheets



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[*]	Notice:	This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).
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[52]	U.S. Cl.	427/579; 427/563; 427/574; 438/788
[58]	Field of Search	427/579, 573; 437/238; 438/788, 789
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